

Single-photon Lasercom Readout Integrated Circuit (ROIC), Phase I

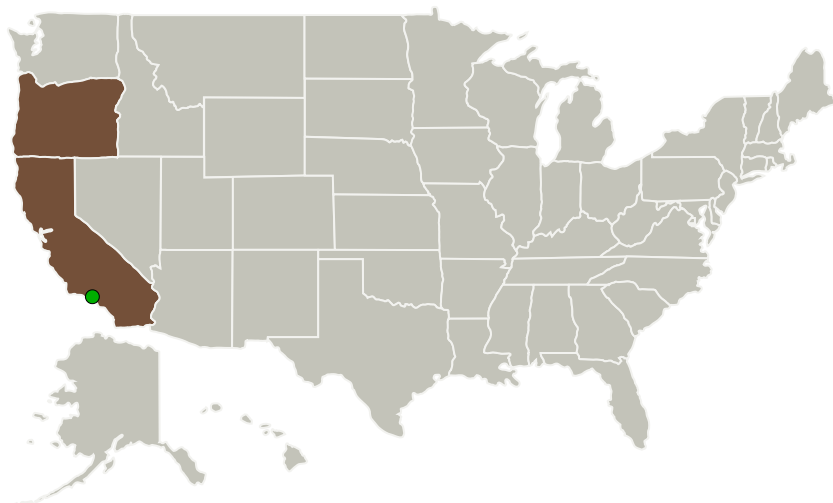
Completed Technology Project (2015 - 2015)



Project Introduction

To satisfy NASA deep-space communications needs, a readout integrated circuit (ROIC) optimized for single-photon counting (SPC) freespace optical communications will be developed, which is optimized for acquisition, tracking, ranging, and reception of the 1064 nm – 1570 nm optical radiation used for freespace optical links. The ROIC will allow simultaneous recovery of photon time of arrival and spatial localization data that can be used for lasercom optical links, data recovery, and range measurements, even in the presence of high photon flux rate objects in the field of view. In Phase I, after developing a rigorous requirements document and confirming a controlled specification, a low-cost ROIC will be developed to couple to single-photon-counting detector arrays. The ROIC pixel circuits will be designed and simulated, as will key circuits, such as serializers, downsamplers, decision circuits, up/down counters, time-to-digital converters (TDCs), etc. When appropriate, circuits from existing ROICs will be demonstrated and characterized to show performance and proof of concept. At Phase I end, a preliminary design review will be conducted.

Primary U.S. Work Locations and Key Partners



Single-photon Lasercom
Readout Integrated Circuit
(ROIC), Phase I

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Organizations Performing Work	Role	Type	Location
Voxel, Inc.	Lead Organization	Industry	Beaverton, Oregon
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	Oregon
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Project Transitions

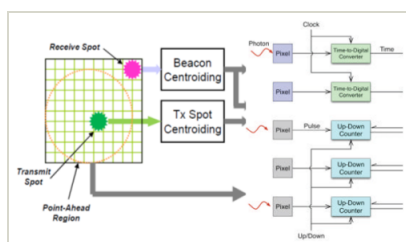
▶ **June 2015:** Project Start

✓ **December 2015:** Closed out

Closeout Documentation:

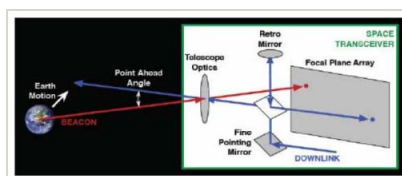
- Final Summary Chart(<https://techport.nasa.gov/file/139336>)

Images



Briefing Chart

Single-photon Lasercom Readout Integrated Circuit (ROIC) Briefing Chart
(<https://techport.nasa.gov/image/130126>)



Final Summary Chart Image

Single-photon Lasercom Readout Integrated Circuit (ROIC), Phase I Project Image
(<https://techport.nasa.gov/image/134492>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Voxel, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Adam Lee

Co-Investigator:

Adam J Lee

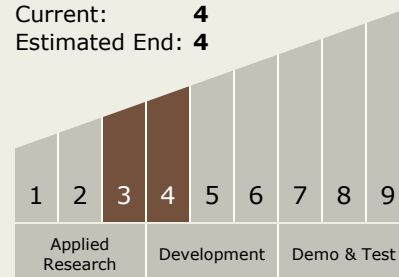
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Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.1 Optical Communications
 - └ TX05.1.1 Detector Development

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System